Problems of the Month
October 2019

General Problem:

We typically say that a year has 52 weeks. But really a year has 365 days (Ignore leap years). This is why December 31st might be a Tuesday this year, but is not a Tuesday next year. How many years will it take until the next time December 31st falls on a Tuesday?

Calculus Problem:

A certain large tree is growing 10 feet from a house. After a severe storm, the tree is discovered to have partially fallen over. It has fallen into the house, creating a gap beneath it! (The wall remained undamaged, somehow.) In an attempt to remove the tree, Joe cuts off the base of the tree and ties it to his bobcat. He then powers the bobcat away from the house at 2.4mph. Find the equation that gives the speed of the tip of the tree sliding down the house. Then find the maximum speed that the tip of the tree reaches.

Challenge Problem:
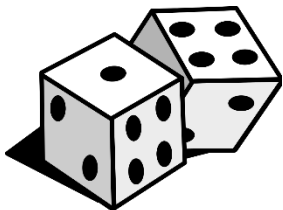
Zeb rolls two, fair, six sided dice. Calling the product of the two dice P and the sum of the dice S, he then solves the equation $x^2 + P = Sx$. He records both solutions, recording the root twice if it happens to be a double root. What is the expected value of all the solutions he finds?